PROC. BIOL. SOC. WASH.
94(2), 1981, pp. 437–444

A NEW GENUS AND A NEW SPECIES OF HELMINTHOGLYPTID LAND SNAILS FROM THE MOJAVE DESERT OF CALIFORNIA

Walter B. Miller

Abstract.—A new genus, *Eremariontoides,* is erected for *Eremarionta argus* (Edson, 1912) because its anatomy differs significantly from that of *Eremarionta* Pilsbry, 1913. A new species of *Eremarionta, E. greggi,* is described for populations that had been considered conspecific with *E. argus* but whose anatomy reveals them to be typical *Eremarionta.*

In 1912, H. M. Edson described *Sonorella argus* from dead shells collected by A. M. Strong at the Iron Cap copper mine in Revenue Canyon, Argus Mts., California. Pilsbry (1939) assigned this species to the genus *Micrarionta* Ancey, 1880, subgenus *Eremarionta* Pilsbry, 1913, on the basis of shell characters only. *Eremarionta* was raised to generic rank by Bequaert and Miller (1973) because its anatomy and shell characters were sufficiently different from *Micrarionta* to render questionable the implied close phylogeny conferred by subgeneric status.

W. O. Gregg and I have dissected topotypes of *E. argus* and found that the anatomy of the reproductive system is considerably different from that of typical *Eremarionta.* There is no dart sac, no mucus glands, and the epiphallic caecum is reduced to a minute apical appendage on the epiphallus; furthermore, the penis and epiphallus are greatly shortened from the usual *Eremarionta* structures.

Over a period of years, Gregg and I have obtained specimens of *E. argus* from other localities in the Argus Mts., especially Homewood Canyon, at the southern end of the range, and we have found that all specimens dissected exhibit the same anatomy as the topotypes. More recently, specimens from the Slate Range, a spur of the Argus Range, have also revealed a similar anatomy.

By contrast, specimens from Johnson Canyon, in the Panamint Mts., which had been considered conspecific with *E. argus* on the basis of shell characters, have revealed a typical *Eremarionta* anatomy, with dart sac, mucus glands, long epiphallic caecum, and appropriate penial characteristics. Additional collecting in the eastern end of the Avawatz Mts., east of Fort Irwin, has yielded specimens similar to those found in the Panamint Mts., both in shell morphology and in reproductive anatomy.

It is apparent that the Argus and Slate populations have undergone major

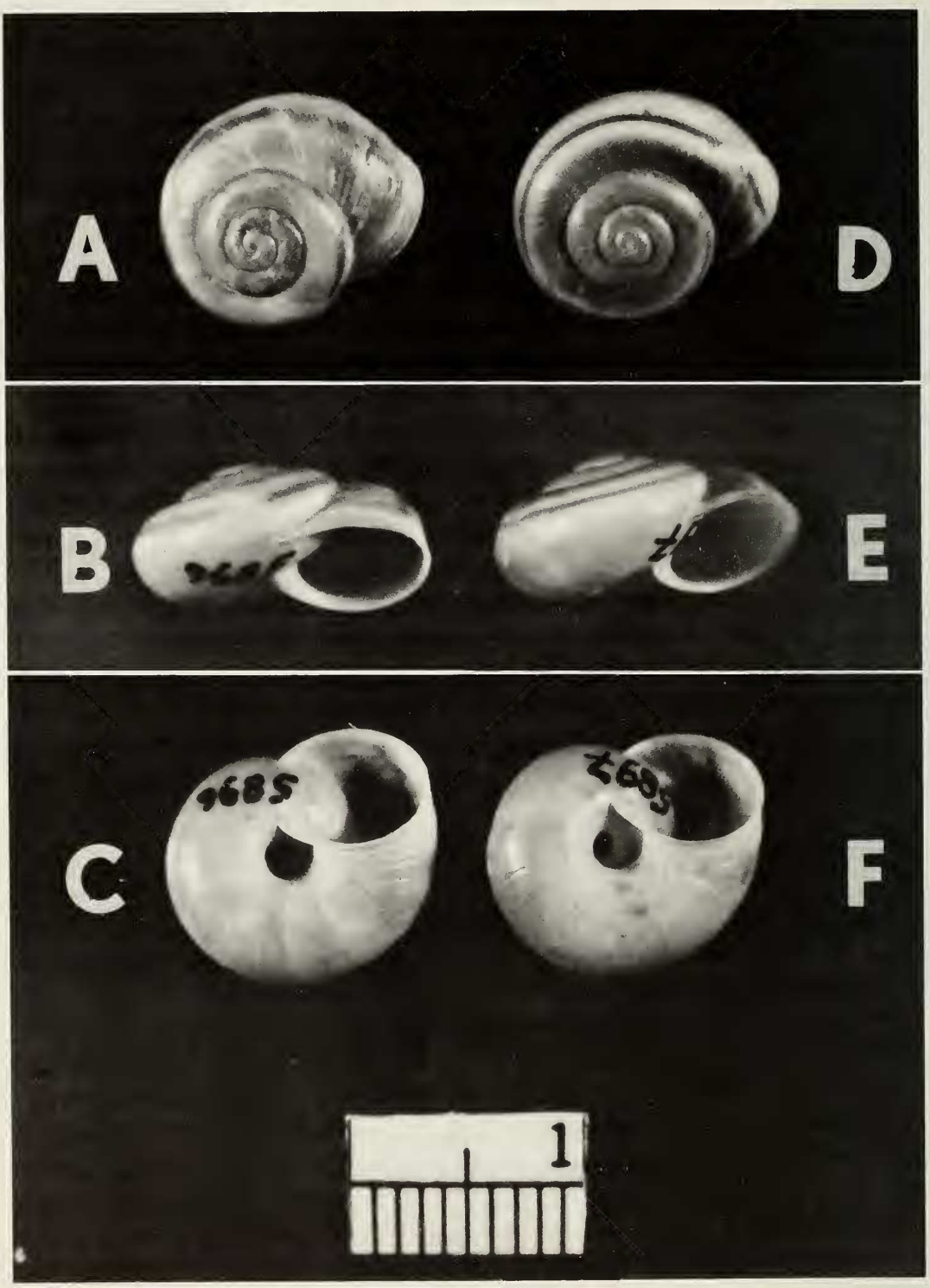

Fig. 1. A, B, C, Shell of *Eremariontoides argus*; D, E, F, Shell of *Eremarionta gregg* holotype. Scale line, 1 cm.

genetic changes from the populations in the Panamint and Avawatz ranges, probably a form of saltational speciation by chromosomal rearrangement, along the lines of the probable evolution of *Mohavelix micrometalleus* (Berry, 1930) from a population of *Helminthoglypta micrometalleoides* Miller, 1970. Unfortunately, to date, Noorullah Babrakzai has been unsuccessful in attempts to stain for C-bands and G-bands on the relatively very small and numerous chromosomes of any of the Argus, Slate, Panamint, or Avawatz populations. Initial investigations on chromosome spreads of the Argus population, indicate a chromosome number of 2n = 60 (Babrakzai, personal communication). Babrakzai and I suspect that a comparison of chromosome bands would reveal the type of chromosomal rearrangement that has probably occurred.

Meanwhile, in order to reflect correctly the systematic positions of the different populations, it has become necessary to erect a new genus for *E. argus* and to describe a new species for the Panamint and Avawatz populations which, heretofore, have been considered conspecific with *E. argus*.

The following abbreviations for repositories of material are employed: ANSP = Academy of Natural Sciences of Philadelphia; CAS = California Academy of Sciences; CCC = Carl C. Christensen collection; FMNH = Field Museum of Natural History; USNM = U.S. National Museum of Natural History; UTEP = University of Texas at El Paso; WBM = Walter B. Miller collection.

Eremariontoides, new genus
Figs. 1A, B, C; 2A, B

Description.—Eremariontoides is a helminthoglyptid genus with shells similar to *Eremarionta* but with a reproductive anatomy characterized by the complete absence of dart apparatus and mucus glands. Additionally, the spermathecal duct and the spermathecal diverticulum are similar to those of *Eremarionta,* but the epiphallic caecum is reduced to a minute tip at the end of the epiphallus. The epiphallus is short and contains 3–4 longitudinal, anastomosing, thick pilasters which can protrude only slightly to form a minute, verge-like penis-papilla, into the short, saccular penial chamber.

Type-species.—Eremariontoides argus (Edson, 1912).

Distribution.—Eremariontoides is a monotypic genus which has been confirmed only in the Argus and the Slate Ranges of California.

Differential diagnosis.—Eremariontoides joins the list of the west North American helminthoglyptid genera that have lost the dart apparatus and mucus glands, namely *Sonorelix* Berry, 1943, *Sonorella* Pilsbry, 1900, *Mohavelix* Berry, 1943, *Greggelix* Miller, 1972, and *Tryonigens* Pilsbry, 1927.

It is separated from *Sonorella* and *Mohavelix* by its substantial spermathecal diverticulum, its foreshortened and thick epiphallus, and its short

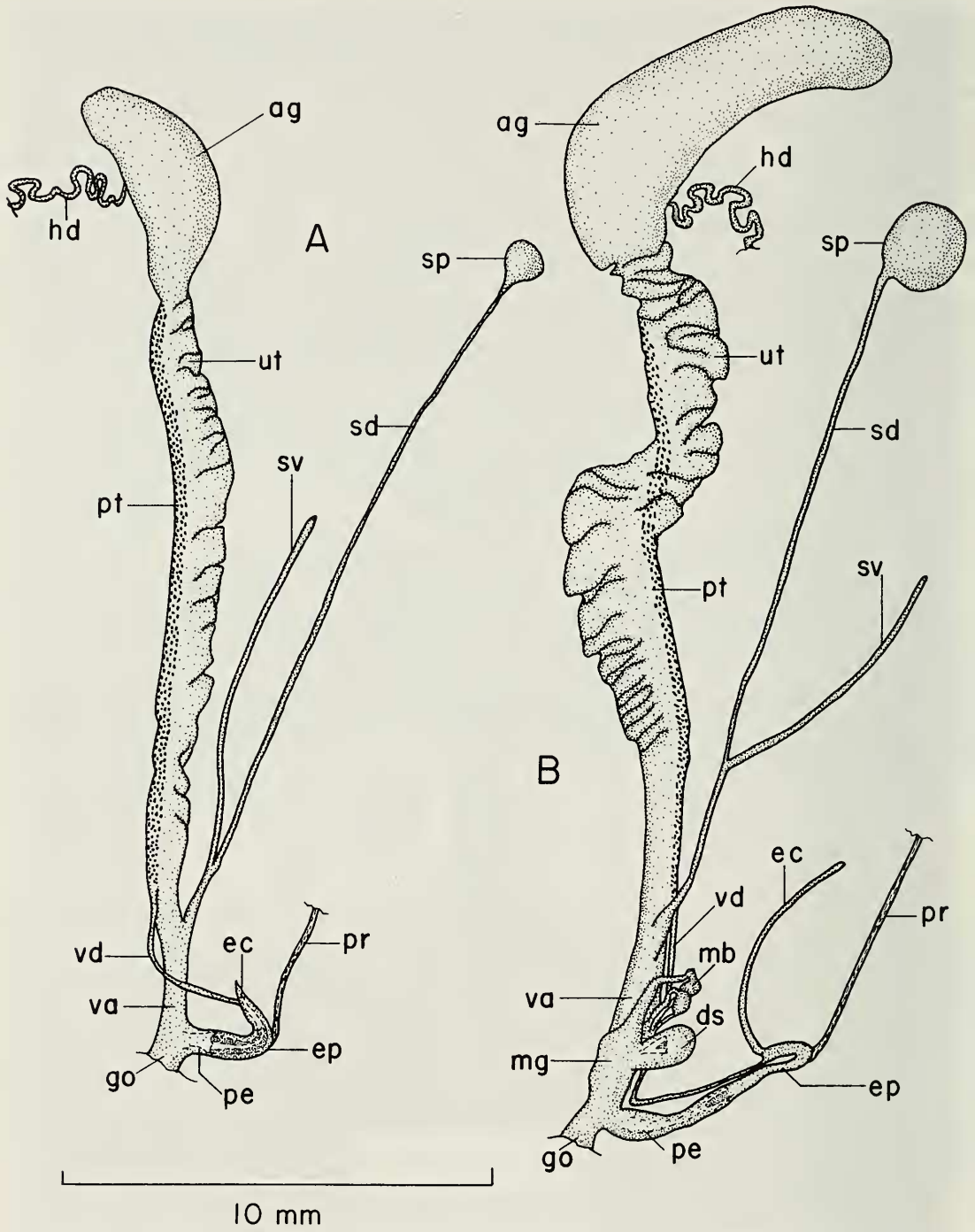

Fig. 2. A, Reproductive system of *Eremariontoides argus*; B, Reproductive system of *Eremarionta greggi*. Both figures to same scale; ovotestes omitted. ag, albumen gland; ds, dart sac; ec, epiphallic caecum; ep, epiphallus; go, genital orifice; hd, hermaphroditic duct; mb, mucus bulb; mg, mucus gland membrane; pe, penis; pr, penial retractor muscle; pt, prostate; sd, spermathecal duct; sp, spermatheca; sv, spermathecal diverticulum; ut, uterus; va, vagina; vd, vas deferens. A, WOG 7765-c stained whole mount, Revenue Canyon, Argus Mts. B, WBM 5897 stained whole mount, Johnson Canyon, Panamint Mts.

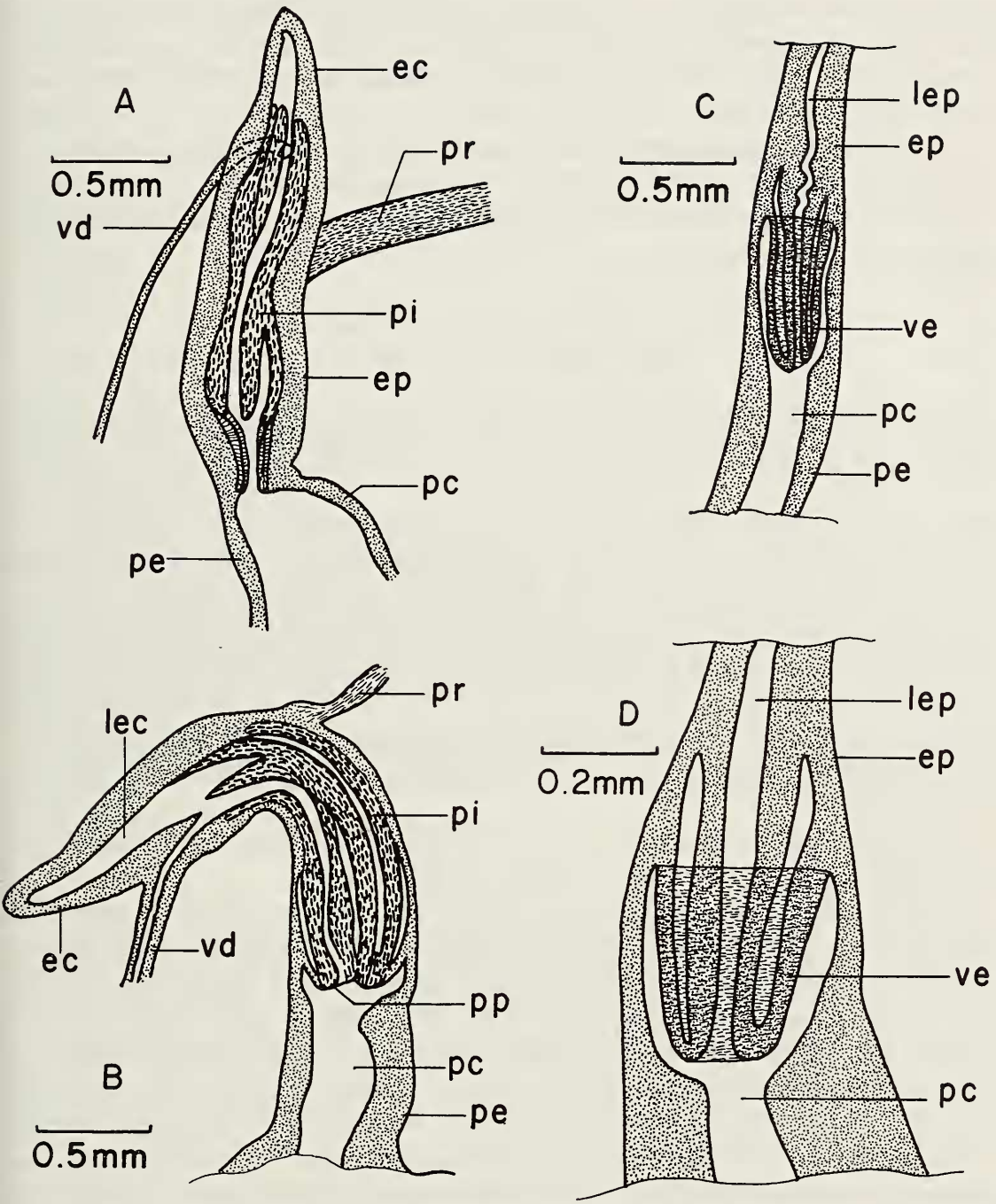

Fig. 3. A and B. Internal structures of male reproductive system of *Eremariontoides argus*. C and D. Internal structures of male reproductive system of *Eremarionta greggi*. All figures drawn from stained whole mounts as seen by camera lucida through compound microscope. A, WBM 5896; B, WOG 7765-c; both from Revenue Canyon, Argus Mts.; C, WBM 5897: D, WOG 7971-c; both from Johnson Canyon, Panamint Mts.; ec, epiphallic caecum; ep, epiphallus; lec, lumen of epiphallic caecum; lep, lumen of epiphallus; pc, penial chamber; pe, penis; pi, pilaster; pp, penis papilla; pr, penial retractor muscle; vd, vas deferens; ve, verge.

penis with occasionally a very slightly everted penis-papilla formed by the protruding distal ends of epiphallic pilasters. It is separated from *Sonorelix* and *Greggelix* by its very short epiphallic caecum and the absence of a true, non-invaginable verge. *Tryonigens* stands apart from all other genera by its extremely short spermathecal duct; otherwise, *Tryonigens* most closely resembles *Sonorella,* and differs from *Eremariontoides* by its sizeable, non-invaginable verge situated in the penial chamber, and by its lack of spermathecal diverticulum.

Eremarionta greggi, new species
Figs. 1D, E, F; 2B; 3C, D

Description of shell of holotype.—Shell small for the genus, with rounded whorls and moderately open umbilicus; color pale-brown, with a typical narrow, dark-brown band above the periphery, bordered on each side by a paler, whitish band. The body whorl descends sharply to the aperture bordered by a slightly expanded peristome. Embryonic shell of 1½ whorls initially glassy smooth, then with light radial wrinkles gradually superimposed with spirally arranged, elongate papillae. Beyond the embryonic shell, the papillae are present for about one more half whorl and then disappear completely; light radial wrinkles persist on all whorls to the aperture. The aperture is rounded-oval with margins converging to the thin parietal callus; the columellar margin of the aperture expanded and slightly reflexed over the umbilicus.

Measurements of holotype.—Shell diameter 12.4 mm, shell height 6.5 mm, unbilicus width 2.1 mm, number of whorls 4.

Reproductive system anatomy of holotype.—The reproductive system is typical for the genus, with a dart-containing dart sac inserted on the vagina, 2 mucus glands whose glandular tissues descend and spread around the vagina and whose ducts lead separately from each of the 2 bulbs into the vagina immediately above the opening of the dart sac. The spermathecal duct is typical for the genus and bears a moderately long spermathecal diverticulum. The penial retractor muscle is attached to the epiphallus which is equipped with a moderately long epiphallic caecum; at its distal end, the epiphallus consists of a short inner tube within an outer tube. The typical penial sac contains a verge at its proximal end which is formed by a partial eversion of the inner tube of the epiphallus.

Remarks.—The shell of *Eremarionta greggi* is in all respects similar to that of *Eremariontoides argus,* with which it has been considered conspecific. As stated by Pilsbry (1939): "the depressed shape and very wide last whorl are its most prominent features." Adult shell measurements in the type lot vary from a minimum diameter of 10.7 mm to a maximum of 13.5 mm and from a minimum height of 5.7 mm to a maximum of 6.9 mm.

The reproductive anatomy is typical for the genus and is not diagnostically distinctive. The verge varies in length in different specimens depending on the degree of evagination of the distal inner epiphallic tube into the penial sac.

I have examined the reproductive system of most of the described species of *Eremarionta* and, in all specimens, I have noted a distinct verge formed by partial eversion of the inner epiphallic tube. Although the anatomy of this type of eversible verge indicated that a complete retraction should be possible, I have never observed such complete retraction. It is possible, however, that the ever-present partial eversion may be an artifact of preparation caused by the method of obtaining the body of the animal by drowning and heating to 60°C in order to avoid breaking the shell. Live, adult specimens of most species of *Eremarionta* are usually rare and difficult to obtain, so that every effort is made to preserve intact both the shell as well as the body of the animal.

Distribution.—Eremarionta greggi is known only from the Panamint Mountains and the Avawatz Mountains of California. It may be present in the Owl Head Mountains and possibly in other nearby ranges where *E. argus* had been said to occur; it will be necessary, however, to examine the anatomy of all such reported specimens before a definite diagnosis can be made.

Disposition of types.—Holotype, USNM 784583; Paratypes, USNM 784584; ANSP 353858; CAS 60745–60747; CCC 3949; FMNH 198998; UTEP 7958; WBM 5897.

Localities of Collections

Topotypes of *Eremariontoides argus* were collected from the following locality: Large, north-facing rockslide located 1.3 miles up Revenue Canyon from the limestone crusher plant, Argus Mts., Inyo Co., CA.

Additional collections of *E. argus* were made at the following localities: 1. Homewood Canyon, Argus Mts., in north-facing rockslides. 2. East side of Slate Mts. in rocks at base of ravines at south end of Panamint Dry Lake.

Type-locality for *Eremarionta greggi*: Johnson Canyon, Panamint Mts., in large north-facing rockslide at a point 6.5 road miles up Johnson Canyon road from the main west side road.

Populations of *E. greggi* were also confirmed in the Avawatz Mts., San Bernardino Co., CA, in north-facing rockslides along the Silver Lake-Fort Irwin road at the boundary of Fort Irwin.

Acknowledgments

The late Wendell O. Gregg introduced me to desert collecting in 1956. He was my constant companion and teacher for many years, and he has be-

queathed to me a large number of undescribed populations of California land snails. His initial investigations in *Eremarionta* and *Eremariontoides* were responsible for the eventual preparation of this paper. I am also indebted for the assistance and camaraderie of Drs. Noorullah Babrakzai, Carl C. Christensen, and H. Lee Fairbanks in the course of several trips to field localities cited above. Their enthusiasm and encouragement contributed significantly to the successful elucidation of this perplexing problem of separating and identifying the many widespread populations of both species.

Literature Cited

Bequaert, J. C., and W. B. Miller. 1973. The mollusks of the arid Southwest.—University of Arizona Press: xvi + 271 pp.

Edson, H. 1912. Two new land shells from California.—Nautilus 26(4):37.

Miller, W. B. 1970. A new species of *Helminthoglypta* from the Mojave Desert.—Veliger 12(3):275–278.

Pilsbry, H. A. 1939. Land Mollusca of North America (north of Mexico).—Acad. Nat. Sci. Monogr. 3 (Vol. I, Pt. 1): xvii + 573 + i–ix pp.

Department of General Biology, University of Arizona, Tucson, Arizona 85721.